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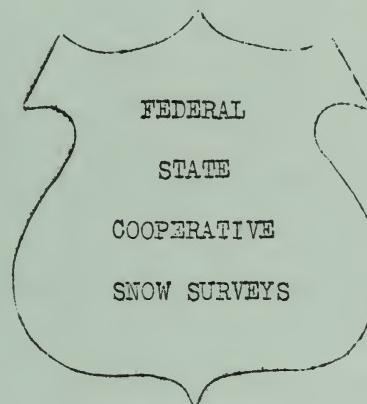
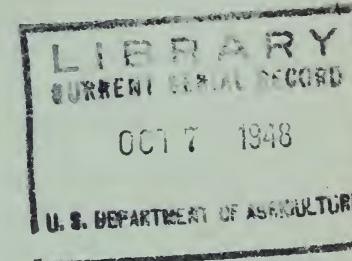
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SNOW SURVEYS AND IRRIGATION WATER FORECASTS

for the

MISSOURI-ARKANSAS RIVERS DRAINAGE BASIN

February 1, 1948



Issued by

Division of Irrigation, Soil Conservation Service  
United States Department of Agriculture  
and  
Colorado Agricultural Experiment Station

\* \* \* \* \*

Data included in this report were obtained by the agencies  
named above in cooperation with the U. S. Forest Service  
National Park Service, State Engineers of Colorado and  
Wyoming, and other Federal, State, and local agencies.



# WATER SUPPLY OUTLOOK

## MISSOURI-ARKANSAS DRAINAGE BASINS

February 1, 1948

The water supply situation on the Missouri River and its tributaries in Montana is favorable. In the mountains near Helena the snow cover is in excess of last year which was well above normal. In the vicinity of Yellowstone Park snow accumulation is relatively less or about average. Throughout Wyoming the water supply outlook is good on all the principal streams. Although no snow surveys were made, the snow cover on the Bighorn should be about the same as last year. On the North Platte watershed, the snow water content is ten percent above a year ago. Reservoir storage on this stream is unusually high. Agricultural conditions in the state are reported as good. For the streams from the east slope of the mountains in Colorado the present water supply prospects are quite favorable. Snow cover on the tributaries of the South Platte and Arkansas Rivers is somewhat above normal and last year. Reservoir storage is slightly higher than on February 1, 1947. Soil Moisture conditions in all areas are good.

### MISSOURI RIVER TRIBUTARIES IN MONTANA

On the headwaters of the streams forming the Missouri River the snow cover is about normal, except on the Jefferson River, where it is better than last year and considerably better than average. In this area and in the mountains near Helena there were recorded the greatest snow depths that have occurred since 1935 on this date. In and around Yellowstone Park on the Madison, Gallatin, and Yellowstone Rivers accumulated snow cover is just below average. Stream flow is reported to be about normal. Storage in Fort Peck declined sharply in the past month and the reservoir now contains 13,130,000 acre-feet. Reservoir storage in Montana is close to the same as February 1, 1947. Soil moisture and crop conditions are good.

WYOMING

Bighorn and tributaries: No snow surveys were made on the Bighorn drainage February 1. From information based on adjacent snow courses, precipitation and reservoir storage, the water supply outlook is not quite as favorable as a year ago but better than normal.

Cheyenne: The water supply prospects appear to be good. Snow water content measured on three courses at higher elevations averages 4.3 inches as compared to 2.7 a year ago. Storage in Belle Fourche Reservoir is 140,000 acre-feet, practically the same as last year, and about 75 percent of capacity. Precipitation on the Belle Fourche project area is below normal.

North Platte. The prospective water supply on this drainage for next season is most favorable. Snow accumulation to February 1 in the mountain areas is 9 percent above average and 5 percent over last year at this time. Storage in the four principal reservoirs on this river in Wyoming now aggregates 1,338,000 acre-feet as compared to 858,000 a year ago. This increase is due to heavy seasonal flow of the stream last year and a low demand for irrigation water in the lower valley. Stream flow is near normal in both Wyoming and Nebraska. Snow cover is unusually heavy in North Park in Colorado and adjacent areas in Wyoming. Recent precipitation in irrigated areas in both states has been normal or slightly below. Range and crop conditions are reported as good. Storage in the Kingsley and Sutherland Reservoirs is now 1,544,000 acre-feet which is almost 400,000 in excess of that stored February 1, 1947.

Laramie River. As shown by February 1 surveys, the average snow water content on the headwaters of this stream was 7.3 inches where the normal is 6.0. The outlook for the next irrigation season is at present very favorable. At Laramie the snow cover is unusually heavy. In the Wheatland area precipitation has been slightly deficient but other conditions are favorable. Storage in the Wheatland reservoirs is near capacity of about 70,000 acre-feet. A year ago 21,800 acre-feet were stored.

South Platte River Basin

Cache la Poudre: Snow on this watershed is somewhat better than a year ago and 36 percent above average. The mountain and valley areas are snow covered. Reservoir storage is 10 percent above last year. The present outlook for the coming season's irrigation water supply is favorable. Soil moisture conditions are good. Stream flow is above normal.

Big Thompson. Snow water content measured on the Hiddle Valley snow course is 7.3 inches as compared to 7.8 a year ago. Due to a complete snow cover over the valley and foothills, the water supply outlook is at least as good as last year. Ten second-feet of water are coming into this stream from the Adams Tunnel. Reservoir storage is about 4 times the amount stored a year ago. Boyd Lake now contains 30,000 acre-feet as compared to 4,400 on February 1, 1947.

St. Vrain. No snow surveys were made on this drainage February 1. However, the snow water content of the University Camp course adjacent to this drainage is 36 percent above normal for this time of year. As for other South Platte tributaries the prospects for adequate irrigation water supply is favorable. Storage in Union Reservoir is now 10,600 acre-feet. A year ago it was 5,500 acre-feet. Soil moisture conditions are good.

Boulder Creek. Snow cover on the headwaters of this stream is particularly favorable at this time and the irrigation water supply outlook is excellent. The snow water content on the University Camp course is 14.0 inches as compared with 10.7 a year ago. Recent valley precipitation has been above average. Soil moisture, range and crop conditions are very good.

Clear Creek. The irrigation water supply prospects on this stream are similar to this time a year ago. Snow water content is 15 percent above average. Precipitation at Denver has been above normal and about ten inches of snow cover the valley area. Soil moisture conditions are described as excellent. Reservoir storage is about 10 percent above February 1, 1947.

South Platte above Denver. Storage in the mountain reservoirs, principally Denver's municipal water supply, now totals 193,400 acre-feet. A year ago at this time it was 166,000. Snow water content at Hoosier Pass is 8.1 inches as compared to 5.4 on February 1 last year. The water supply outlook is unusually good as of this date.

For the entire South Platte drainage, the over-all prospect for next season's irrigation water supply is quite favorable. As far east as Fort Morgan the area is well covered with snow and winter precipitation has been considerably above normal. Reservoir storage in the Fort Lupton area is slightly below last year but above the ten-year average. In the lower valley the Prewitt, Point of Rocks and Julesburg reservoirs now contain a total of 118,800 acre-feet of water as compared to 89,400 a year ago. Soil moisture conditions in this area are reported as fair and the snow cover is light.

#### Arkansas River

At this time the average water content of the snow on the headwaters of the Arkansas and its tributaries is 6.5 inches. A year ago it was 5.4. Reservoir storage in the mountain and plains area now totals approximately 294,000 acre-feet. Last year on February 1, storage in the same reservoir was 211,000 acre-feet. The mountain and plains area is snow covered to an average of about 12 inches. Recent precipitation has been much above average. Soil moisture conditions are reported from fair to good but will improve when snow melts. Snow water content on the Whiskey Creek course on the Purgatoire watershed is 60 percent above last year. The present outlook for next summer's irrigation water supply on the Arkansas is good.

SNOW SURVEYS AND IRRIGATION WATER FORECASTS  
 FOR MISSOURI AND ARKANSAS RIVERS  
 February 1, 1948

PRECIPITATION DATA

WATERSHED	STATE	Precipitation October 1 to January 31	Departure from Normal		Precipitation January Inches	Departure from Normal Inches
			Inches	Inches		
Missouri	East. Mont.	1.80	-0.64		0.49	-0.02
Missouri	Cent. Mont.	3.40	+0.28		0.95	+0.29
Missouri	North Wyo.	5.27	+1.53		1.67	+0.76
North Platte	Wyoming	3.66	+0.36		1.05	+0.22
South Platte	Colorado	6.56	+2.88		1.85	+1.15
Arkansas	Colorado	5.58	+1.99		2.46	+1.74

Accumulated precipitation since October 1, over the watersheds of the Missouri and Arkansas Rivers in Montana, Wyoming and Colorado is above normal, except in eastern Montana. January precipitation follows the same pattern.

SUMMARY OF FEBRUARY 1 SNOW SURVEYS AND COMPARISON OF DATA

WITH THAT OF PREVIOUS YEARS BY MATERSEEDS

MICHIGAN STATE BASTIS ASSOCIATES

WATERSHEDS	Snow Depth Thirteen year Avg.*		Water Content Thirteen year Avg.*		Snow Density Thirteen year Avg.*		Number Courses in Average		Snow Density Thirteen year Avg.*		Percent Percent		1948 Water Content in Percent of Thirteen year Avg.*	
	In.	In.	In.	In.	In.	In.	Percent	Average	Percent	Average	Percent	Percent	Percent	1948
<b>MISSOURI RIVER</b>														
Jefferson River	15.4	17.1	20.3	2.7	3.1	3.7	17	18	25	137	119	70	131	1947
Madison River	34.1	41.1	31.3	8.1	11.1	7.8	24	27	26	97	91	60	100	1948
Gallatin River	38.7	50.2	34.4	9.7	14.6	8.0	25	29	19	96	95	65	103	1947
Yellowstone River	25.8	32.5	27.9	5.4	5.6	9.2	21	25	28	25	24	170	41	1948
Missouri River**	23.5	33.3	37.5	5.6	11.2	20.2	24	32	27	73	31	32	136	1947
Marias River	35.5	63.3	30.4	11.2	23.0	2.7	17	17	19	139	17	19	159	1948
Cheyenne River	18.2	16.2	23.0	3.1	4.3	4.3	25	26	26	28	25	26	105	1947
North Platte River	44.0	44.1	43.4	11.2	11.6	12.2	8	8	109	109	105	122	122	1948
Laramie River	24.8	25.6	30.5	6.0	6.0	7.3	5	24	24	24	24	24	122	1947
South Platte River**	20.1	24.2	28.0	3.5	3.9	4.8	3	17	16	17	17	17	123	1948
Crow Creek	13.9	14.5	21.6	2.7	2.6	4.6	1	19	18	21	19	18	177	1947
Poudre River	21.2	20.1	31.4	5.6	6.5	7.6	3	26	32	24	21	21	117	1948
St. Vrain River	27.3	38.4	33.5	5.8	7.8	7.3	1	21	20	22	170	136	126	1947
Boulder Creek	35.8	37.0	45.0	10.3	10.7	14.0	1	29	29	31	8.8	8.8	131	1948
Clear Creek	34.6	36.2	41.5	7.9	7.9	6.5	2	23	24	21	111	111	100	1947
<b>ARKANSAS RIVER</b>														
	27.2	27.4	32.1	5.7	5.4	6.5	9	21	20	20	114	114	120	1947

\* Some for shorter periods

\*\*Between Helena and Great Falls

\*\* Above Denver, Colo.

## MISSOURI-ARKANSAS RIVERS SNOW SURVEYS, February 1, 1948

DRAINAGE BASIN and SNOW COURSE	LOCATION										SNOW COURSE MEASUREMENTS				
	No. and State	Sec.	Twp. or Lat.	Rang e or Long.	Elev.	Date of Survey	Snow Depth (Inches)	Water Content (Inches)	1946	1947	1948	Years of Record	Avg. Water Content (Inches)	Past Record	
JEFFERSON RIVER															
Camp Creek*	6 Ida.	21	13N	36E	6800	2/2	20.3	3.7	9.3	7.0	11				
Picnic Grounds	Mont.	22	5N	6W	6500				3.1	2.8	4			2.7	
Gibbons Pass	"	4	2S	19W	7100				23.5	18.1	9				
Pipestone Pass	30 "	11	1N	7W	7200				5.0	2.8	9				
MADISON RIVER															
Aster Creek*	2 Wyo.		44.2N	110.6W	7700				23.4	21.2	11				
Lewis L. Divide*	8 "		44.2N	110.7W	7900				32.9	28.8	11				
Big Springs*	3 Ida.	34	14N	41E	6500				15.0	13.6	11				
W. Yellowstone	16 Mont.	34	13S	5E	6700	2/2	23.0	9.4	9.2	14.6	11			6.8	
21-Mile*	"	1	11S	5E	7150	2/2	34.4	8.8	12.3	12.3	11			9.7	
Hebgen Dam	"	22	11S	4E	6550	2/2	36.5	9.5	9.2	9.5	11			7.8	
Valley View	Ida.	7	15N	44E	6500				11.2	—	3				
GALLATIN RIVER									7.8	11.1	10.0				
Mystic Lake #1	Mont.	31	35	7E	6600				5.4	6.6	11				
Mystic Lake #2	"	31	35	7E	6500				4.0	5.9	11				
21-Mile	"	1	11S	5E	7120	2/2	34.4	8.8	14.6	12.3	11			9.7	
YELLOWSTONE RIVER									8.8	—	12.3				
Lupine Creek	40 Wyo.		44.9N	110.6W	7300	2/1	27.9	5.2	8.0	6.7	7			5.4	
MISSOURI RIVER**															
Chessmen Res.	6 Mont.	2	8N	5W	6200	2/4	26.8	6.6	5.0	2.6	11			3.1	
Lower Rimini	"	13	8N	6W	6250	2/1	33.4	7.2	4.0	4.0	11			4.5	
Middle Rimini	42 "	13	8N	6W	6300	2/1	42.0	10.5	6.5	6.5	11			6.6	
Upper Rimini	43 "	19	8N	5W	8000	2/1	47.5	13.8	9.2	8.4	11			8.4	
									37.5	—	5.6				

\*On adjacent drainage

\*\*Between Helena and Great Falls

DRAINAGE BASIN and SNOW COURSE	No. and State	LOCATION			SNOW COURSE MEASUREMENTS			Years of Record	Past Record
		Sec.	Twp.	Range	Elev.	Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Avg. Water Content (Inches)
MARIAS RIVER	20 Mont.	48.3N	113.4W	5250	2/3	MISSOURI RIVER	8.2	20.2	11.2
CHEYENNE RIVER	1 S.Dak.	3N	1E	6500	1/30		5.7	2.7	3.9
Upper Spearfish	2 "	2N	1E	6800	1/31		4.7	3.1	3.3
Upper Castle	2 "	1N	2E	6000	1/30		2.6	2.4	2.2
Deerfield	3 "	Average for drainage			23.0		4.3	2.7	3.1
NORTH PLATTE RIVER	1 Colo.	2	6N	76W	10300	1/31	51.4	14.2	11.3
Cameron Pass	2 "	21	5N	82W	9300	1/31	54.5	15.8	12.9
Columbine Lodge	24	14N	85W	8200	2/1		28.7	7.3	6.9
Bottle Creek	7 Wyo.	27	14N	85W	9000	2/1	35.4	10.2	9.0
Webber Spring	8 "	29	14N	85W	9800	1/31	54.0	17.7	17.0
Old Battle	9 "	27	16N	80W	10200	1/29	51.8	15.5	15.4
N. French Creek	37 "	30	16N	80W	9400	1/28	43.0	10.2	10.6
N. Barrett Creek #2	38 "	34	16N	81W	8400	1/29	28.8	5.9	6.1
Ryan Park #2	39 "	Average for drainage			43.4		12.2	12.4	11.2
LARAMIE RIVER	3 Wyo.	11	16N	79W	10200	1/31	41.9	11.9	11.8
Brooklyn Lake	11 "	21	13N	78W	9200	1/30	32.2	6.6	5.0
Fox Park	34 "	35	15N	72W	8700	1/30	21.6	4.6	2.7
Pole Mtn. #2*	34 "	29	16N	78W	8700	1/31	27.7	6.3	4.9
Libby Lodge #2	35 "	24	16N	79W	9500	1/31	29.1	7.2	5.8
Hairpin Turn #2	36 "	Average for drainage			30.5		7.3	6.0	6.0
CROW CREEK	34 Wyo.	35	15N	72W	8700	1/30	21.6	4.6	2.7
Polo Mtn. #2								2.6	1.2
POULRE RIVER	1 Colo.	2	6N	76W	10300	1/31	51.4	13.5	11.3
Cameron Pass	2 "	6	7N	75W	9000	1/30	29.1	6.4	4.2
Chambers Lake	3 "	33	8N	75N	8600	2/1	13.6	2.9	1.3
Big South								7.0	6.1

\*On adjacent drainage

MISSOURI-ARKANSAS RIVERS SNOW SURVEYS, February 1, 1948

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DRAINAGE BASIN AND SNOW COURSE	LOCATION						SNOW COURSE MEASUREMENTS				Past Record
	No. and State	Sec.	Twp.	Range	Elev.	Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Years of Record	Av. Water Content (Inches)	
						MISSOURI RIVER	1947	1946	In.	In.	
BIG THOMPSON RIVER											
Leake Irene*	65 Colo.	8	5N	75W	10600	2/1	33.5	7.3	9	5.8	
Hidden Valley #2	95 "	23	5N	74W	9550						
ST. VRAIN RIVER											
Wild Basin											
BOULDER CREEK											
University Camp #2	60 Colo.	28	1N	73W	10300	1/30	45.0	14.0	10.7	16.6	10.3
CLEAR CREEK											
Loveland Pass #2	61 Colo.	27	4S	76W	10100	1/30	38.9	7.3	7.6	10.7	6.5
Grizzly Peak*	97 "	2	5S	76W	11250	1/28	44.1	10.3	9.9	11.8	9.3
SOUTH PLATTE RIVER (Above Denver)											
Hoosier Pass	14 Colo.	13	8S	78W	11400	1/31	33.0	6.6	5.4	8.1	5.7
Fairplay	15 "	33	9S	77W	10000	2/1	18.0	2.5	1.6	0.5	0.8
Jefferson Cr. #2	83 "	14	7S	76W	10100	1/31	32.9	5.4	4.7	6.8	4.0
ARKANSAS RIVER											
Tennessee Pass	19 Colo.	21	8S	80W	10200	2/2	29.0	4.6	5.2	7.2	4.6
Twin Lakes T.	21 "	22	11S	82W	10500	1/30	30.0	6.1	7.4	7.1	6.0
Marshall Cr.*	42 "	24	48N	6E	10800	2/1	31.3	5.8	5.2	5.3	6.6
Poncha Cr.	43 "	19	48N	7E	10500	2/1	25.7	6.2	4.3	4.7	6.2
Whiskey Cr. #2	72 "	37	2N	105.2W	10300	1/30	22.3	5.5	3.3	2.1	3.6
La Veta Pass #2*	74 "	22	28S	70W	9300	1/30	37.4	7.0	7.0	3.3	4.9
Four Mile Park #2	78 "	23	11S	81W	9700	2/2	18.5	3.5	2.5	4.7	2.4
Bremont Pass #2*	79 "	2	8S	79W	11400	1/29	49.6	9.4	9.0	11.4	8.2
Monarch Pass	92 "	16	49N	6E	10500	1/30	44.9	10.1	10.8	10.8	9.1
						Average for drainage					

\*On adjacent drainage

The following organizations cooperate in the snow surveys and irrigation water supply forecasts for the Colorado, Missouri-Arkansas and Rio Grande watersheds by furnishing funds or services.

STATE

Colorado State Engineer  
Wyoming State Engineer  
Utah State Engineer  
New Mexico State Engineer  
Montana State Engineer  
Nebraska State Engineer  
Colorado Experiment Station  
Colorado Extension Service  
Montana Experiment Station  
Utah Experiment Station

FEDERAL

Department of Agriculture  
Forest Service  
Soil Conservation Service  
Department of Interior  
Bureau of Reclamation  
Geological Survey  
National Park Service  
Department of Commerce  
Weather Bureau  
War Department  
Army Engineer Corps

PUBLIC UTILITIES

Colorado Public Service Company  
Western Colorado Power Company  
Montana Power Company  
Public Service Company of New Mexico  
Denver and Rio Grande Western R. R. Company

MUNICIPALITIES

City of Bozeman  
City of Denver  
City of Boulder

WATER USERS ORGANIZATIONS

Poudre Valley Water Users' Association  
Arkansas Valley Ditch Association  
Colorado River Water Conservation District

IRRIGATION PROJECTS

Farmers Reservoir and Irrigation Company  
San Luis Valley Irrigation District  
Santa Maria Reservoir Company  
Costilla Land Company  
Uncompahgre Valley Water Users' Association  
Wyoming Development Company  
Goshen Irrigation District  
Kendrick Project  
Pathfinder Irrigation District  
Salt River Valley Water Users' Association  
San Carlos Irrigation and Drainage District  
Twin Lakes Reservoir and Canal Company

Many other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.

